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| L8 | 0 | 703/21 and emulat$4 with power and (@ad<"20001004" @rlad<"20001004") and @pd>"20040820" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 11:50 |
| L9 | 2 | "703"/$ and emulat$4 with power and (@ad<"20001004" @rlad<"20001004") and @pd>"20040820" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 11:51 |
| L10 | 0 | 710/62 and emulat$4 with power and (@ad<"20001004" @rlad<"20001004") and @pd>"20040820" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 11:51 |

| L11 | 4 | "710"/$ and emulat$4 with power and (@ad<"20001004" @rlad<"20001004") and @pd>"20040820" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 11:52 |
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| L12 | 0 | 711/1 and emulat$4 with power and (@ad<"20001004" @rlad<"20001004") and @pd>"20040820" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 11:52 |
| L13 | 1 | "711"/$ and emulat$4 with power and (@ad<"20001004" @rlad<"20001004") and @pd>"20040820" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 11:52 |
| L14 | 1 | 714/28 and emulat$4 with power and (@ad<"20001004" @rlad<"20001004") and @pd>"20040820" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 11:53 |
| L15 | 1 | 714/29 and emulat$4 with power and (@ad<"20001004" @rlad<"20001004") and @pd>"20040820" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 11:53 |
| L16 | 2 | "714"/$ and emulat$4 with power and (@ad<"20001004" @rlad<"20001004") and @pd>"20040820" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 11:53 |
| L17 | 0 | 717/134 and emulat$4 with power and (@ad<"20001004" @rlad<"20001004") and @pd>"20040820" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 11:53 |
| L18 | 0 | 717/138 and emulat$4 with power and (@ad<"20001004" @rlad<"20001004") and @pd>"20040820" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 11:53 |
| L19 | 2 | "717"/$ and emulat$4 with power and (@ad<"20001004" @rlad<"20001004") and @pd>"20040820" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 11:54 |
| L20 | 10 | emulat$4 with power and (@ad<"20001004" @rlad<"20001004") and @pd>"20040820" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 11:56 |

| L21 | 1 | storage with emulat$4 with power and (@ad<"20001004" @rlad<"20001004") and @pd>"20040820" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 11:56 |
|---|---|---|---|---|---|---|
| L22 | 2 | (storage memory) with emulat$4 with power and (@ad<"20001004" @rlad<"20001004") and @pd>"20040820" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 12:00 |
| L23 | 3 | (storage memory) same emulat$4 with power and (@ad<"20001004" @rlad<"20001004") and @pd>"20040820" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 11:57 |
| L24 | 12 | (storage memory) same emulat$4 same power and (@ad<"20001004" @rlad<"20001004") and @pd>"20040820" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 11:58 |
| L25 | 5 | (storage memory) with emulat$4 same power and (@ad<"20001004" @rlad<"20001004") and @pd>"20040820" | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 11:57 |
| L28 | 120 | (storage memory) with emulat$4 with power and (@ad<"20001004" @rlad<"20001004") | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 12:06 |
| L29 | 39 | (storage memory) near3 emulat$4 with power and (@ad<"20001004" @rlad<"20001004") | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 12:00 |
| L30 | 20 | "703"/$ and (storage memory) with emulat$4 with power and (@ad<"20001004" @rlad<"20001004") | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2004/11/19 12:06 |

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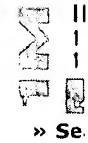
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[Abstract]    [PDF Full-Text (316 KB)]    **IEEE CNF**

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2 **A compiler address transformation for conflict-free access of memoi and networks**
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3 **Fast active inrush current limiter for boost-based resistor emulators**
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4 **A new zero-ripple switching DC-to-DC converter and integrated magnetics**
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**5 An efficient frame memory interface of MPEG-2 video encoder ASIC**
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Pages:507 - 514

[Abstract]    [PDF Full-Text (552 KB)]    **IEEE JNL**

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**7 Optical power requirements for an optoelectronic database filter ba: on VCSEL/HPT smart pixel arrays**
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**10 The long-term performance of the S-band klystron modulator syste the CERN LEP pre-injector**
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11 **A board system for high-speed image analysis and neural networks**
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12 **A portable programmable digital sound processor for cochlear impl research**
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13 **CONDOR: an architecture for controlling the Utah-MIT dexterous ha**
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14 **Commercial design verification: methodology and tools**
*Pixley, C.; Strader, N.R.; Bruce, W.C.; Jaehong Park; Kaufmann, M.; Shultz, I Burns, M.; Kumar, J.; Jun Yuan; Nguyen, J.;*
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[Abstract]    [PDF Full-Text (1124 KB)]    **IEEE CNF**

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15 **Computer control of the high-voltage power supply for the DIII-D electron cyclotron heating system**
*Clow, D.D.; Kellman, D.H.;*
Fusion Engineering, 1991. Proceedings., 14th IEEE/NPSS Symposium on , 30 Sept.-3 Oct. 1991
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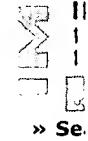
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*G.; Malamy, A.; Marston, A.; Mehta, K.; Nanda, S.; Van Nguyen, H.; Patel, R.*
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9 **Fine-grain system architectures for systolic emulation of neural
algorithms**
*Ramacher, U.; Raab, W.;*
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10 **An impulse realization of short-term-memory dynamics**
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**1** System-level power optimization: techniques and tools     ■
Luca Benini, Giovanni de Micheli
April 2000 **ACM Transactions on Design Automation of Electronic Systems (TODAES)**,
Volume 5 Issue 2

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This tutorial surveys design methods for energy-efficient system-level design. We consider electronic sytems consisting of a hardware platform and software layers. We consider the three major constituents of hardware that consume energy, namely computation, communication, and storage units, and we review methods of reducing their energy consumption. We also study models for analyzing the energy cost of software, and methods for energy-efficient software design and compilation. This survery ...

**2** Power: Conserving disk energy in network servers     ■
Enrique V. Carrera, Eduardo Pinheiro, Ricardo Bianchini
June 2003 **Proceedings of the 17th annual international conference on Supercomputing**

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In this paper we study four approaches to conserving disk energy in high-performance network servers. The first approach is to leverage the extensive work on laptop disks and power disks down during periods of idleness. The second approach is to replace high-performance disks with a set of lower power disks that can achieve the same performance and reliability. The third approach is to combine high-performance and laptop disks, such that only one of these two sets of disks is powered on at a tim ...

**Keywords**: disk power, energy conservation, network servers

**3** Real-time garbage collection for flash-memory storage systems of real-time embedded ■
systems
Li-Pin Chang, Tei-Wei Kuo, Shi-Wu Lo
November 2004 **ACM Transactions on Embedded Computing Systems (TECS)**, Volume 3
Issue 4

Full text available: 📄 pdf(465.38 KB)   Additional Information: full citation, abstract, references, index terms

Flash-memory technology is becoming critical in building embedded systems applications because of its shock-resistant, power economic, and nonvolatile nature. With the recent technology breakthroughs in both capacity and reliability, flash-memory storage systems are now very popular in many types of embedded systems. However, because flash memory is a write-once and bulk-erase medium, we need a translation layer and a garbage-collection mechanism to provide applications a transparent storage ...

**Keywords**: Embedded systems, flash memory, garbage collection, real-time system, storage systems

4 Energy-aware design of embedded memories: A survey of technologies, architectures, and optimization techniques
Luca Benini, Alberto Macii, Massimo Poncino
February 2003 **ACM Transactions on Embedded Computing Systems (TECS)**, Volume 2 Issue 1
Full text available: pdf(288.44 KB)    Additional Information: full citation, abstract, references, index terms

Embedded systems are often designed under stringent energy consumption budgets, to limit heat generation and battery size. Since memory systems consume a significant amount of energy to store and to forward data, it is then imperative to balance power consumption and performance in memory system design. Contemporary system design focuses on the trade-off between performance and energy consumption in processing and storage units, as well as in their interconnections. Although memory design is as ...

**Keywords**: Embedded systems, embedded memories, integration, memories, nonvolatile, system-on-a-chip, volatile

5 Dynamic power management of electronic systems
Luca Benini, Alessandro Bogliolo, Giovanni De Micheli
November 1998 **Proceedings of the 1998 IEEE/ACM international conference on Computer-aided design**
Full text available: pdf(1.19 MB)    Additional Information: full citation, references, citings, index terms

6 Policy optimization for dynamic power management
G. A. Paleologo, L. Benini, A. Bogliolo, G. De Micheli
May 1998 **Proceedings of the 35th annual conference on Design automation - Volume 00**
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Dynamic power management schemes (also called policies) can be used to control the power consumption levels of electronic systems, by setting their components in different states, each characterized by a performance level and a power consumption. In this paper, we describe power-managed systems using a finite-state, stochastic model. Furthermore, we show that the fundamental problem of finding an optimal policy which maximizes the average performance level of a system, subject to a ...

**Keywords**: emulation, functional simulation, reconstruction, visibility

7 Pen computing: a technology overview and a vision
André Meyer

July 1995 **ACM SIGCHI Bulletin**, Volume 27 Issue 3

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This work gives an overview of a new technology that is attracting growing interest in public as well as in the computer industry itself. The visible difference from other technologies is in the use of a pen or pencil as the primary means of interaction between a user and a machine, picking up the familiar pen and paper interface metaphor. From this follows a set of consequences that will be analyzed and put into context with other emerging technologies and visions.Starting with a short historic ...

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Gordon B. Davis, John T. Gorgone, J. Daniel Couger, David L. Feinstein, Herbert E. Longenecker
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**10** Fast detection of communication patterns in distributed executions
Thomas Kunz, Michiel F. H. Seuren
November 1997 **Proceedings of the 1997 conference of the Centre for Advanced Studies on Collaborative research**
Full text available: pdf(4.21 MB)      Additional Information: full citation, abstract, references, index terms

Understanding distributed applications is a tedious and difficult task. Visualizations based on process-time diagrams are often used to obtain a better understanding of the execution of the application. The visualization tool we use is Poet, an event tracer developed at the University of Waterloo. However, these diagrams are often very complex and do not provide the user with the desired overview of the application. In our experience, such tools display repeated occurrences of non-trivial commun ...

**11** Software-Only Bus Encoding Techniques for an Embedded System
Wei-Chung Cheng, Jian-Lin Liang, Massoud Pedram
January 2002 **Proceedings of the 2002 conference on Asia South Pacific design automation/VLSI Design**
Full text available: pdf(174.60 KB)
                    Publisher Site        Additional Information: full citation, abstract

Microprocessors with built-in Liquid Crystal Device (LCD) controllers and equipped with Flash memory are common in mobile computing applications. In the first part of the paper, a software-only encoding technique is proposed to reduce the power consumption of the processor-memory bus when displaying an image on the LCD. Based on the translation mechanism of the LCD controller, our approach is to start with the palette as a coding table for the pixel buffer and then reassign the codes according t ...

**Keywords**: memory bus encoding, low power, bus activity minimization, LCD,

CompactFlash, Flash memory

## 12 Managing energy and server resources in hosting centers

Jeffrey S. Chase, Darrell C. Anderson, Prachi N. Thakar, Amin M. Vahdat, Ronald P. Doyle
October 2001 **ACM SIGOPS Operating Systems Review , Proceedings of the eighteenth ACM symposium on Operating systems principles**, Volume 35 Issue 5

Full text available: pdf(1.61 MB)   Additional Information: full citation, abstract, references, citings, index terms

Internet hosting centers serve multiple service sites from a common hardware base. This paper presents the design and implementation of an architecture for resource management in a hosting center operating system, with an emphasis on *energy* as a driving resource management issue for large server clusters. The goals are to provision server resources for co-hosted services in a way that automatically adapts to offered load, improve the energy efficiency of server clusters by dynamically res ...

## 13 Distributed operating systems

Andrew S. Tanenbaum, Robbert Van Renesse
December 1985 **ACM Computing Surveys (CSUR)**, Volume 17 Issue 4

Full text available: pdf(5.49 MB)   Additional Information: full citation, abstract, references, citings, index terms, review

Distributed operating systems have many aspects in common with centralized ones, but they also differ in certain ways. This paper is intended as an introduction to distributed operating systems, and especially to current university research about them. After a discussion of what constitutes a distributed operating system and how it is distinguished from a computer network, various key design issues are discussed. Then several examples of current research projects are examined in some detail ...

## 14 ECOSystem: managing energy as a first class operating system resource

Heng Zeng, Carla S. Ellis, Alvin R. Lebeck, Amin Vahdat
October 2002 **Proceedings of the 10th international conference on Architectural support for programming languages and operating systems**, Volume 37 , 30 , 36 Issue 10 , 5 , 5

Full text available: pdf(1.17 MB)   Additional Information: full citation, abstract, references, citings

Energy consumption has recently been widely recognized as a major challenge of computer systems design. This paper explores how to support energy as a first-class operating system resource. Energy, because of its global system nature, presents challenges beyond those of conventional resource management. To meet these challenges we propose the Currentcy Model that unifies energy accounting over diverse hardware components and enables fair allocation of available energy among applications. Our par ...

## 15 Microprocessor applications in the nuclear industry

C. Dwayne Ethiridge
April 1980 **ACM SIGCAS Computers and Society**, Volume 10 Issue 3-4

Full text available: pdf(986.50 KB)   Additional Information: full citation, abstract, references

Microprocessors in the nuclear industry, particularly at the los Al amos Scientific Laboratory, have been and are being utilized in a wide variety of applications ranging from data acquistion and control for basic physics research to monitoring special nuclear material in long-term storage. Microprocessor systems have been developed to support weapons diagnostics measurements during undergorund weapons testing at the Nevada Test Site. Multiple single-component microcomputers are now controlling ...

**16**

<u>Session 5: An adaptive serial-parallel CAM architecture for low-power cache blocks</u>

Aristides Efthymiou, Jim D. Garside

August 2002 **Proceedings of the 2002 international symposium on Low power electronics and design**

Full text available: pdf(151.38 KB)    Additional Information: <u>full citation</u>, <u>abstract</u>, <u>references</u>, <u>citings</u>, <u>index terms</u>

There is an on-going debate about which consumes less energy: a RAM-tagged associative cache with an intelligent order of accessing its tags and ways (e.g. way prediction), or a CAM-tagged high associativity cache. If a CAM search can consume less than twice the energy of reading a tag RAM, it would probably be the preferred option for low-power applications. Based on memory traces --- which usually cause tag mismatch within the lower four bits --- a new serial CAM organisation is proposed which ...

**Keywords**: CAM, VLSI, asynchronous circuits, cache design, low energy, low power

**17** <u>Managing battery lifetime with energy-aware adaptation</u>

Jason Flinn, M. Satyanarayanan

May 2004  **ACM Transactions on Computer Systems (TOCS)**, Volume 22 Issue 2

Full text available: pdf(1.61 MB)    Additional Information: <u>full citation</u>, <u>abstract</u>, <u>references</u>, <u>index terms</u>

We demonstrate that a collaborative relationship between the operating system and applications can be used to meet user-specified goals for battery duration. We first describe a novel profiling-based approach for accurately measuring application and system energy consumption. We then show how applications can dynamically modify their behavior to conserve energy. We extend the Linux operating system to yield battery lifetimes of user-specified duration. By monitoring energy supply and demand and ...

**Keywords**: Power management, adaptation

**18** <u>Development and application of NASA's first standard spacecraft computer</u>

Charles E. Trevathan, Thomas D. Taylor, Raymond G. Hartenstein, Ann C. Merwarth, William N. Stewart

September 1984 **Communications of the ACM**, Volume 27 Issue 9

Full text available: pdf(1.26 MB)    Additional Information: <u>full citation</u>, <u>abstract</u>, <u>citings</u>, <u>index terms</u>

To provide the autonomy needed by low, earth-orbiting satellites, NASA's first standard on-board processor requires changing only interfacing hardware from mission to mission.

**Keywords**: PASS, avionics system

**19** <u>Launching the new era</u>

Kazuhiro Fuchi, Robert Kowalski, Koichi Furukawa, Kazunori Ueda, Ken Kahn, Takashi Chikayama, Evan Tick

March 1993 **Communications of the ACM**, Volume 36 Issue 3

Full text available: pdf(3.45 MB)    Additional Information: <u>full citation</u>, <u>references</u>, <u>index terms</u>, <u>review</u>

**20** <u>Energy conservation for mobile devices: Ghosts in the machine: interfaces for better power management</u>

Manish Anand, Edmund B. Nightingale, Jason Flinn

June 2004 **Proceedings of the 2nd international conference on Mobile systems,**

**applications, and services**

Full text available: pdf(294.14 KB)     Additional Information: <u>full citation</u>, <u>abstract</u>, <u>references</u>, <u>index terms</u>

We observe that the modularity of current power management algorithms often leads to poor results. We propose two new interfaces that pierce the abstraction barrier that inhibits device power management. First, an OS power manager allows applications to query the current power mode of I/O devices to evaluate the performance and energy cost of alternative strategies for reading and writing data. Second, we allow applications to disclose *ghost hints* that enable better power management in th ...

**Keywords**: adaptive caching, energy-awareness, power management

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